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COMMENTARY

One Health: people, animals, and the environment

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Ronald M. Atlas and Stanley Maloy (eds.). *One Health: people, animals, and the environment*. Washington, DC: American Society for Microbiology Press, 2014. 330 pp. US$90.00 (Paperback), ISBN: 978-1-55581-842-5.

'One Health' is a term used to describe the linkage of human, animal, and environmental health (1). The idea to view health in a more holistic way is not new, but the term 'One Health' has only recently gained traction in the scientific community (2–4). In order to make One Health work, professionals from different disciplines need to come together to monitor and control threats to health in all three domains. This may sound simple, but it requires an understanding of what is/should be included in the concept of 'One Health'. Gibbs (4), Häsler et al. (5), as well as Lerner and Berg (6) recently pointed out that the term 'One Health' is used in many different contexts and by people with different educational backgrounds who have varying opinions of what constitutes 'One Health'. All this led to confusion among clinicians and scientists, and caused an intense and ongoing debate. Perhaps, the 'umbrella' depiction developed by 'One Health Sweden' in cooperation with the 'One Health Initiative' (Fig. 1) (4, 6, 7) provides currently the most useful information about the scope of One Health and the interconnectedness of the various scientific disciplines. Despite the debate about the definition of 'One Health', it is to my knowledge not disputed that One Health is 1) a powerful concept and holistic approach, 2) a local, regional, national, and worldwide strategy, 3) a truly multi- and interdisciplinary approach, 4) a coordinated and collaborative effort, and involves 5) initiatives, organizations, and institutions around the world, which all aim at one goal, which is to benefit the health of humans, animals, and the environment.

Because of the importance of One Health, academicians have recognized the need for education in this field, which includes not only ecosystem and environmental health training for physicians and veterinarians (8) but also the offering of new degree programs in One Health (9). Today, competency training in One Health has been incorporated in many core curricula, masters and doctoral degree programs have been established at several universities, and workshops and conferences are available to provide a broad range of opportunities for learning (4, 10, 11). There are now also several textbooks on the market which can be used for instruction in One Health. One of these books, *One Health: People, Animals, and the Environment*, published by Atlas and Maloy (12), has recently become available. The review of this book is the subject of the remainder of this commentary.

The editors Atlas and Maloy (12) consider One Health as an emerging discipline which is critical for the future control of infectious diseases. They point out that many new as well as re-emerging infectious diseases have been arising around the globe during the past three decades. Furthermore, there is a significant increase in antibiotic resistance development against pathogens. The editors believe that the One Health approach can be used to respond to these health threats as it allows for the development of 'harmonized strategies for disease detection and prevention'.

Atlas and Maloy (12) assembled a group of 74 internationally recognized contributors who developed a total of 20 chapters that cover diverse topics related to One Health. The book is divided into five major sections. The first section, which comprises five chapters, serves as an introduction to One Health. Lonnie J. King, the author of the first chapter, describes why there is a need for a One Health approach: 'We live in a world that is rapidly changing, complex, and progressively more interconnected. The convergence of people, animals, and their products embedded in a threatened environment has resulted in an unprecedented 21st-century mixing bowl'. The authors of the second chapter point out that the ecosystem of microbes, humans, and animals exists in a delicate balance, and that any changes to this balance can lead to opportunities for microbes to cross the species barrier.

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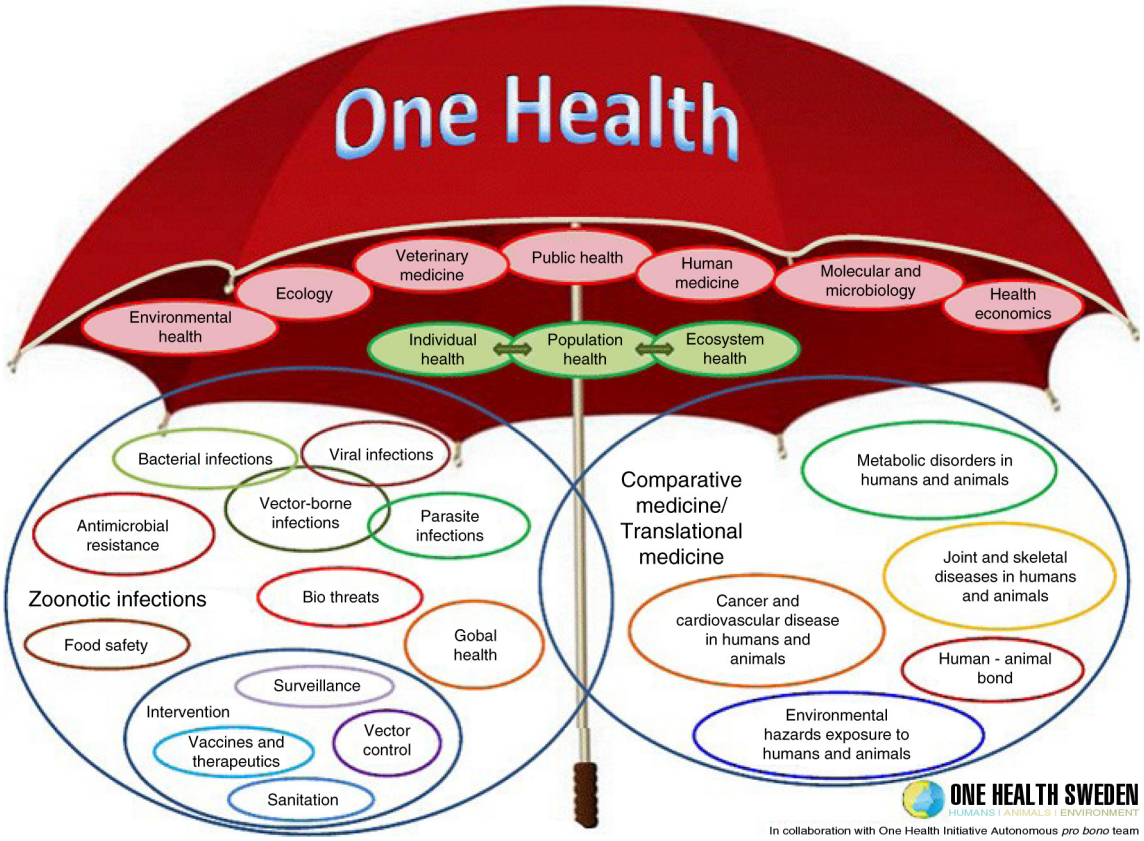

Fig. 1. 'Umbrella' depiction of the scope of One Health as developed by 'One Health Sweden' in collaboration with the 'One Health Initiative.' Available from: www.onehealthinitiative.com/about.php

The third chapter is about the human–animal interface. The authors define this interface as 'a continuum of contacts and interactions between humans, animals, their products, and their environment' and recognize it as an ever-growing driver of infectious disease emergence in humans, domesticated animals, and in wildlife. The authors of Chapter 4 point out that the majority of newly emerging infectious diseases is of zoonotic origin and that about 75% of these diseases come specifically from wildlife. They review host pathogen ecology, transmission dynamics, and disturbances to host–pathogen systems, as well as methods for modeling disease systems (e.g. the capture-mark-recapture method and modeling of species occupancy). The fifth chapter deals with the role of emerging infectious diseases of wildlife and of species conservation. Specific topics include the geographic origin of pathogens, the role of biodiversity, the effect of landscape structure, and the effect of alien species.

The second section contains six chapters. The authors provide here the reader with detailed information about zoonotic and environmental drivers by looking at several specific emerging infectious diseases. These include a case study of the biology of RNA viruses (Chapter 6); factors that impact the control of rabies, such as low priority, poor surveillance, and insufficient reporting (Chapter 7); and the emergence of influenza viruses with a focus on genomic features, reservoirs, and transmission modes, as well as risk assessment and management (Chapter 8). Furthermore, there are chapters about *Salmonella* food-borne disease (Chapter 9), cholera (Chapter 10), and the white-nose syndrome of bats, which is caused by a fungal pathogen: *Geomyces destructans* (Chapter 11). In sum, the authors of these chapters provide the reader with compelling examples of how the study of environmental and ecological factors can help researchers to get a better understanding of pathogens and their transmission to humans.

The third section contains only one chapter (Chapter 12), which is about One Health and the rising problem of antibiotic resistance development. Julian Davies provides a fascinating review of the history of chemotherapy, the emergence and mechanisms of antibiotic resistance, and the prevalence of resistance genes/gene clusters, as well as the clinical significance of resistance development. He presents two valuable lists: 1) suggested approaches to control/prevent antibiotic resistance and 2) well-drafted questions for researchers' understanding of both the biology of antibiotics and antibiotic resistance development.

'Disease Surveillance' is the topic of the fourth section. More specifically, the author of Chapter 13 discusses various regional and global public health surveillance networks,

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including their benefits (e.g. early detection, reporting, and response) as well as their current shortcomings (e.g. fragmentation). Web-based surveillance systems are discussed in the following chapter. These include not only those systems that focus on animal cases alone (e.g. GermTraX) or on animal and human cases [e.g. Emergency Prevention System (EMPRES-i)] but also systems that report animal, human, and plant cases (e.g. BioCaster Global Health Monitor and ProMED-mail). While Chapter 15 deals with genomic and metagenomic approaches for predicting pathogen evolution, Chapter 16 is about surveillance of wildlife diseases in light of the lessons learned from the 1999 West Nile virus outbreak in the eastern United States and its subsequent spread throughout the North American continent.

The fifth and final section is entitled 'Making One Health a Reality'. It contains four chapters, in which the authors emphasize the importance of fostering a collaborative approach with improved communication and clear recognition of the roles of each participant (Chapter 17), the necessity to cross bureaucratic boundaries through the creation of cross-sectoral working alliances (Chapter 18), and the need for an interprofessional and transdisciplinary framework as well as the development of a new generation of academic and professional leaders who can help create an integrated scientific knowledge base (Chapter 19). In the final chapter, which is written by the editors, the future of One Health is discussed. Atlas and Maloy reiterate that 'the recognition that human, animal, and ecological health are integrally interconnected has given rise to a growing recognition of the importance of crossing boundaries that have arisen in education, research, and practice'. They believe that One Health approaches provide opportunities that are likely to have a positive impact on public health.

In my opinion, this book is written in a clear and concise manner and is sufficiently illustrated. Each chapter is self-contained and includes a reference section useful for further reading. Although there is a 12-page functional index, a glossary of important terms is missing, which if present would have made this book even more useful, particularly for newcomers to the field. Nevertheless, I believe that Atlas and Maloy's book can serve well as an instructional text in various disciplines in which the concept of One Health is being taught. These disciplines include, for example, medicine, veterinary medicine, microbiology, and public health, as well as biogeography, ecology, and environmental and conservation biology. This book can be quite useful not only for trainees in One Health but also for seasoned professionals to either learn the principles of One Health or simply refresh their knowledge. I fully agree with the editors that 'this book presents core concepts, compelling evidence, successful applications, and the remaining challenges of One Health approaches to thwarting the threat of emerging infectious disease'. I highly recommend this book to the reader.

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